Chapter 21
Multimedia-Enabled Dot Codes as Communication Technologies

Shigeru Ikuta
Otsuma Women's University, Japan

ABSTRACT

The author has been using new dot codes developed independently by Gridmark, Inc. and Apollo Japan and conducting school activities with original handmade teaching materials overlaid with these dot codes in collaboration with schoolteachers all over the world. In the chapter, just touching the "invisible" dot codes printed on the paper or symbol icons by using a sound pen clearly reproduces voices and sounds. By using a scanner pen connected to a tablet or PC, multimedia sources such as movies, web pages, and PowerPoint files, in addition to voices and sounds, can be reproduced on its screen. In this chapter, state-of-the-art dot code technology including a recently developed new application for a smart phone is outlined, and basic information regarding the creation of original handmade materials using dot codes and the use at both general and special needs schools is presented.

INTRODUCTION

Augmentative and alternative communication (AAC) technologies are widely used, providing students with severe speech, language, and communication difficulties the opportunity to improve their communication, and by extension, their relationships with others. AAC systems utilize assistive technology (AT) devices that range from no-tech to high-tech. Modifying young children's environments by using AT, defined as any tool, device, or adaptation that allows them more ways to gain access to the people, places, and setting where they can be exposed to typical developmental activities, increases opportunities for learning (Sadao & Robinson, 2010). Dell, Newton, and Petroff (2016) described the practical use of such devices in a classroom. Carpenter, Johnston, and Beard (2014) published a text for both in-service and pre-service educators to introduce AT. Jonge, Scherer, and Rodger (2007) provided an opportunity to try to understand the experiences of AT users in the workplace.

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A widely used AAC tool, voice output communication aids (VOCAs) utilize single-level or multi-level outputs to convey sounds. Although there are a variety of VOCAs catering to students with different abilities and needs (Inclusive design research center, 2016; RESEARCH AUTISM, 2016), most devices are severely hampered by their low-output numbers and short lengths of time that they can record.

Approximately ten years ago, to address the above problems the present author started using Scan Talk dot codes developed by Olympus Co. (1999). Such codes transform voices and sounds into two-dimensional dot codes directly outputted on ordinary paper. Students with severe hand, finger, or mental challenges, however, could not correctly trace Scan Talk codes using the Scan Talk Reader. The present author, therefore, used new dot codes developed independently by Gridmark, Inc. (2009) and Apollo Japan (2005) and conducted school activities with original handmade teaching materials overlaid with these dot codes. In our work, just touching the "invisible" dot codes printed on the paper or symbol icons by using a sound pen clearly reproduces voices and sounds. By using the identical sound pen or a scanner pen connected to a tablet or PC, multimedia sources such as movies, Web pages, and PowerPoint files, in addition to voices and sounds, can be reproduced on its screen.

In this article, state-of-the-art dot code technology is outlined, and basic information regarding the creation of original handmade materials using dot codes and the use at both general and special needs schools is presented.

BACKGROUND

Outline of Dot Code Technology

GridOnput Dot Codes

GridOnput (Gridmark, 2009) is a set of novel two-dimensional codes comprising extremely small dots. Such dot codes can invisibly overlay any graphically printed letters, photos, and illustrations with no impact on the designed visual images, meaning that letters, photos, and illustrations can be changed into information-trigger icons. A maximum of four voices and sounds can be linked to each icon, as well as other media such as movies, Web pages, and PowerPoint files. Simply touching the dot codes printed on ordinary paper with a sound pen (e.g., G-Talk or G-Speak) or a scanner pen (e.g., G-Pen) enables students to directly access the corresponding digital information.

To print document content that includes the "invisible" GridOnput dot codes, industry-standard Cyan-Magenta-Yellow-Black (CMYK) processes are required. More specifically, carbon ink that absorbs infrared rays is used only for dot code printing, while non-carbon ink is used to print graphics. The sound and scanner pens read the invisible dot codes using built-in infrared cameras.

ScreenCode Dot Codes

Developed by Apollo Japan (2005), ScreenCode is a microscopic barcode that allows developers to map data onto printed surfaces, such as printed documents. Unlike other data-coding systems that map data onto expensive metallic-based inks, ScreenCode allows users to map data using regular ink similar to that found in household printers. Apollo Japan has recently published their ScreenCode smartphone and tablet application in which the built-in camera of the smartphone and tablet, using a specially designed